

and at sunset snow was falling at points above 900 feet altitude; this is the first snowstorm since January, 1891. Julian: a rainstorm with west wind on the 17th; at sunset the wind shifted to east and snowfall began. Lick Observatory: the cold northwest winds of the 16th and 17th gave maximum velocities of 80 miles hourly, and gusts of 100 miles. Lodi: 16th, 8.30 p. m., north wind began, increasing to a gale by midnight. Napa City: 16th, 9.55 p. m., wind suddenly changed to a northerly gale; temperature rose 14° in five minutes and then gradually declined. Niles: on the 17th, late in the evening, strongest wind experienced for 42 years. Pasadena: 17th, 9 p. m. to 9.30 p. m., temperature fell from 55.5° to 39°; wind changed from light southeast to high northwest, with heavy rain and hail and followed by light frost. San Jacinto: snowstorm 17th from 5 to 6 p. m. Turlock: destructive northerly gale on 17th.

**Georgia.**—Rainfall has been deficient in the interior and the soil exceptionally dry, and therefore warm, so that the more hardy annual vegetation had not been killed by the end of the month.

**Indiana.**—Traces of snow were noted on the 15th and a few other days, and the weather was exceedingly favorable to farm work and crops. Winter wheat is in the best condition to stand severe winter weather, being deeply rooted and vigorous.

**Maryland.**—The ground is in fine condition and weather very favorable for farm work.

**Mississippi.**—Rains were more frequent than during October, but had very little effect in retarding field work; most of the crops have been harvested under the most favorable circumstances.

**Nevada.**—The lack of sufficient moisture has allowed the feed to dry up

and, in some localities, considerable anxiety is felt for the stock; the record for the snowfall was very light compared with November, 1893.

**Ohio.**—Precipitation was deficient but well distributed and generally sufficient for cereals; snowfall was light but fell opportunely and gave considerable protection to the wheat.

**Oklahoma.**—The dry weather of October caused immense prairie fires, and the wet weather and severe frosts of November prevented any growth of grass, hence the cattle ranges are poor.

**South Carolina.**—The soil is favorable for seeding wheat and oats; copious showers kept the ground in good condition for working and also aided germination.

**South Dakota.**—Up to the 20th the ground averaged bare although snows had fallen and, therefore, stock could generally feed on the range; after the 20th snows were more frequent and generally staid on the ground and it began to be necessary to feed the stock.

**Virginia.**—The rainfall near the coast was nearly twice the normal, decreasing to the western portion of the state, where it was less than half the normal; the weather has generally been favorable for farm work.

**Wisconsin.**—The snowfall has been heavy and the total precipitation quite evenly and advantageously distributed, although the first ten days were not specially favorable to agriculture, as the ground was too dry for fall seeding. After the snow fell it gave complete protection to growing grain during the severely cold weather that prevailed during the last ten days of the month.

**Wyoming.**—Grass on the ranges has been cropped rather short; if the present early snows are reinforced by additional snowfall it will go hard with the cattle on the ranges.

## WIND.

The prevailing winds in November, 1893, viz., those that were recorded most frequently, are shown on Chart II by arrows flying with the wind. Northwest winds prevail as usual in the Northwest and Missouri Valley and easterly winds in the south Atlantic and Gulf states.

### HIGH WINDS. (In miles per hour.)

Wind velocities of 50 miles, or more, per hour were reported at regular stations of the Weather Bureau as follows:

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Amarillo, Tex. ....	11	60	n.	Keeler, Cal. ....	18	60	ne.
Do. ....	28	52	n.	Kittyhawk, N. C. ....	8	58	ne.
Do. ....	30	50	n.	Do. ....	9	54	n.
Block Island, R. I. ....	10	50	ne.	Do. ....	27	51	n.
Buffalo, N. Y. ....	22	50	sw.	Lander, Wyo. ....	28	50	w.
Do. ....	28	50	w.	Lexington, Ky. ....	29	50	sw.
Colorado Springs, Colo. ....	21	50	sw.	Pensacola, Fla. ....	27	50	se.
Do. ....	30	50	nw.	Pikes Peak, Colo. ....	21	50	w.
Chicago, Ill. ....	17	51	sw.	Do. ....	23	84	nw.
Dodge City, Kans. ....	25	52	se.	Do. ....	25	84	sw.
Eastport, Me. ....	25	52	se.	Do. ....	29	90	sw.
Fort Canby, Wash. ....	26	52	se.	Do. ....	30	104	sw.
Do. ....	26	58	s.	Tatoosh Island, Wash. ....	6	50	s.
Do. ....	26	58	s.	Do. ....	13	50	e.
Do. ....	10	70	s.	Do. ....	22	59	e.
Do. ....	10	70	s.	Do. ....	23	80	e.
Do. ....	20	64	s.	Do. ....	25	50	nw.
Do. ....	22	58	se.	Do. ....	28	50	e.
Do. ....	23	50	s.	Do. ....	29	57	e.
Do. ....	24	72	sw.	Winnemucca, Nev. ....	24	57	sw.
Do. ....	25	72	se.	Do. ....	28	58	sw.
Do. ....	26	89	se.				

### LOCAL STORMS.

**6-8th.**—A heavy storm of wind and rain prevailed along the Pacific coast from northern Washington to San Francisco, Cal. At Fort Canby, Wash., the wind reached a maximum velocity of 68 miles per hour. Near Lake Cushman, Wash., damage was done by the heavy rain. Railroad traffic was delayed for several days and trains on the Northern Pacific Railroad did not run until the 10th. Six spans of the Northern Pacific trestle near Clarks Fork Station, Mont., were washed out on the 8th.

**8-9th.**—At Norfolk, Va., a heavy northeast storm began the early morning of the 8th and continued until the morning of the 9th. The wind reached a maximum velocity of 34 miles per hour, and the rainfall was exceptionally heavy, 5.77

inches falling during the storm. Minor damage was done to buildings.

**13th.**—An unusually severe storm prevailed in Delaware. A number of houses were blown down and one person was killed. Several wrecks occurred in Chesapeake Bay.

**15-16th.**—Heavy snow storms prevailed in New York and Pennsylvania. At Oswego, N. Y., snow began the evening of the 15th and continued until the early morning of the 16th, accompanied by high wind. A schooner broke adrift from the outer breakwater, and a tug going to her assistance was blown into shoal water. Both vessels were a total loss, and the captain of the tug was drowned. At 3.49 a. m. of the 16th a violent gust struck the city, attended by a heavy fall of sleet. The storm seemed to be a diminutive tornado, its approach and departure being attended by a heavy rumbling sound like a train of cars. No exceptionally high wind was recorded at the Weather Bureau office. A house was partially destroyed, and in the same vicinity other damage was done. A schooner in the harbor was damaged during the passage of this storm, the captain of the vessel reporting the wind very high. At Dunkirk, N. Y., the snowfall was very heavy. Business was interrupted and railroad trains delayed.

**17th.**—A northwest gale occurred on Lakes Superior, Huron, and Michigan, and on Lake Erie the wind was strong from the southwest. No boats ventured out from Buffalo. At the head of Lake Superior the storm was accompanied by snow. Heavy rain and wind storms prevailed in central California. At San Francisco high north wind in the early morning reached a maximum velocity of 47 miles per hour. Several houses were unroofed and damage was done to houses in the bay. At Sonoma high wind blew roofs from barns and did other damage. In Stanislaus County the gale was very destructive. At Centerville a very severe storm in the early morning did a great amount of damage. At Mount Hamilton the wind reached a maximum velocity of 80 miles per hour, with gusts of over 100 miles. At Lodi the storm began the night of the 16th and increased to a gale at midnight; outbuildings were unroofed and other damage done. At Kelseyville the gale damaged trees. At Fruitvale a house in course of erection was demolished and fences and trees blown down.

**21st.**—The first blizzard of the season occurred in Minnesota on November 21, and advanced southeastward into Illi-

nois. At Detroit it was noticed that the snow flakes were of enormous size, the diameter being little smaller than a silver dollar; the air was warm and the snow soon turned to rain. A gust of wind moving in a narrow path passed over the island 2 miles north of Hatteras, N. C., at 8.50 p. m. Minor damage was done. Heavy gales and snow prevailed over the Great Lakes and the upper Mississippi valley. At nearly all the Lake stations the storm continued during the 22d. All vessels remained in port and a number of out vessels were over due. The steamer "Arabia" arrived at Bayfield, Wis., on the 22d and reported the storm on Lake Superior the worst in years. The wind blew a furious gale, driving a dense fall of snow before it. At Grand Haven, Mich., snow began at 11 a. m., 21st, and continued until the 23d. The wind increased to high at 7 p. m., 21st, with heavy squalls, and the gale continued throughout the greater portion of the 22d; a heavy sea was running. A schooner was caught in the storm and damaged, and another small schooner was beached 5 miles from port.

**24th.**—A heavy thunderstorm passed east and south of Eureka, Cal. Considerable damage was done to the jetty work at the mouth of Humboldt Bay. Damage was also done to electric wires.

**26th.**—A severe storm (possibly a tornado) passed over Port Eads, La., and vicinity. With one exception every house on both sides of the river was flooded. Damage was done to outhouses and fences; the water rose two feet higher than ever before.

**27th.**—At Paterson, N. J., a heavy windstorm blew down fences and trees. A heavy thunder, wind, and rain storm passed over Pensacola, Fla., in the early morning. The wind reached a maximum velocity of 56 miles per hour. A house was struck by lightning; several vessels dragged their anchors, and a large amount of timber was cast adrift in the bay.

**28th.**—At Boston, Mass., rain began in the early morning and ended 10 a. m., attended by high wind, reaching a maximum velocity of 39 miles per hour. Considerable damage was done to shipping by high wind and heavy seas. A schooner reported foundered off Dread Ledge, Swampscott. At Egg Rock, off Nahant, Mass., a southeast gale, with heavy rain, prevailed. A vessel was sunk about three-fourths of a mile from station and all persons on board were drowned. A report from Eureka, Cal., states that heavy rains prevailed along the Mad and Eel rivers and damage was done by flood.

**29th.**—A severe windstorm at South Fork, Ky., blew down timber and fences.

### INLAND NAVIGATION.

#### STAGE OF WATER IN RIVERS.

The following table shows the danger-points at the various river stations; the highest and lowest stages for the month, with the dates of occurrence; and the monthly ranges:

*Heights of rivers above low-water mark, November, 1898.*

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Height.	Date.	Height.	Date.	
<i>Red River.</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>		<i>Feet.</i>
Shreveport, La.	29.2	—1.0	30	—2.5	17-21	1.5
<i>Arkansas River.</i>						
Fort Smith, Ark.	22.0	6.4	30	0.0	23-25	6.4
Little Rock, Ark.	23.0	7.4	30	2.9	11, 20	4.5
<i>Missouri River.</i>						
Fort Buford, N. Dak.*	25.0	8.0	25	5.9	23	2.1
Bismarck, N. Dak.	75.0					
Pierre, S. Dak.	13.0					
Sioux City, Iowa†	18.7	6.6	15	6.0	10, 20-23	0.6
Omaha, Nebr.	18.0					
Kansas City, Mo.	21.0	6.3	21, 22	4.8	30	1.5
<i>Mississippi River.</i>						
Saint Paul, Minn.	14.0	3.0	1, 2	0.6	26	2.4
La Crosse, Wis.	10.0	2.7	28-30	1.6	25	1.1
Dubuque, Iowa‡	16.0	2.7	1	0.9	29, 30	1.8
Davenport, Iowa	15.0	1.6	1-5	0.0	28-30	1.6
Keokuk, Iowa	14.0	1.4	2, 3	—1.9	27, 30	3.3
Hannibal, Mo.	17.0	1.9	1-4	0.3	28-30	1.6
Saint Louis, Mo.	30.0	3.4	6	2.5	30	0.9
Cairo, Ill.	40.0	7.6	2-4	5.3	30	2.3
Memphis, Tenn.	33.0	4.6	1	3.0	29, 30	1.6
Vicksburg, Miss.	41.0	3.6	3	0.4	19, 20	3.2
New Orleans, La.	13.0	4.2	27, 28	2.9	9	1.3
<i>Ohio River.</i>						
Parkersburg, W. Va.	38.0	7.3	10	2.8	19, 21	4.5
Cincinnati, Ohio	45.0	13.8	8, 9	6.4	27	7.4
Louisville, Ky.	24.0	6.9	10, 11	4.0	26, 27	2.9
<i>Cumberland River.</i>						
Nashville, Tenn.	40.0	3.3	29, 30	0.6	2, 3	2.7
<i>Tennessee River.</i>						
Chattanooga, Tenn.	33.0	4.8	12	2.3	9	2.5
Knoxville, Tenn.	29.0					
<i>Monongahela River.</i>						
Pittsburg, Pa.	22.0	8.0	7	5.3	16	2.7
<i>Savannah River.</i>						
Augusta, Ga.	32.6	8.2	30	5.7	3	2.5
<i>Willamette River.</i>						
Portland, Oregon	15.0	14.0	30	2.0	2, 3	12.0
<i>Susquehanna River.</i>						
Harrisburg, Pa.	17.0	3.7	30	1.6	22, 23, 26, 27	2.1
<i>Alabama River.</i>						
Montgomery, Ala.	48.0	2.2	29	0.1	1-3	2.1
<i>James River.</i>						
Lynchburg, Va.	18.0	3.4	29	0.8	26, 27	2.6
<i>Sacramento River.</i>						
Red Bluff, Cal.	22.0					
Sacramento, Cal.	25.0	18.3	29	7.5	5, 6	10.6
<i>Des Moines River.</i>						
Des Moines, Iowa§	19.0	3.1	1	2.9	3-17, 19	0.2

\* For 25 days.

† For 23 days.

‡ For 26 days.

§ For 20 days.

#### FLOODS.

The above table shows that during the month of November the only rivers that experienced special high waters were the Willamette River at Portland, Oregon, on the 30th, and the Sacramento River at Sacramento, Cal., on the 29th. The following additional report has been received:

The Columbia rose 6 feet between the 3d and 12th at The Dalles, Oregon, and an erroneous newspaper report of a rise of 6 feet in 12 hours should be corrected accordingly.

#### CLOSING OF NAVIGATION.

The dates of closing of navigation by ice in rivers and harbors are reported as follows:

*Black River.*—Port Huron, Mich., thin floating ice 24th; frozen over 25th.

*Delaware River.*—Trenton, N. J., canal frozen 26th.

*Grand River.*—Lansing, Mich., closed 23d.

*Hudson River.*—Albany, N. Y., ice on river 26th; ice floating down 27th.

*Illinois River.*—Beardstown, Ill., frozen 23d.

*Manitowoc River.*—Manitowoc, Wis., closed 14th.

*Minnesota River.*—Belle Plaine, Minn., covered with thin ice 20th.

*Mississippi River.*—Saint Cloud, Minn., river frozen 18th. Saint Paul, Minn., thin floating ice 23d; gorged, and frozen above the bridge, 24th; frozen, except at the foot of Jackson street, 30th. Hastings, Minn., closed 18th. Red Wing, Minn., frozen 24th. Winona, Minn., frozen 29th. North McGregor, Iowa, gorged 24th. Dubuque, Iowa, frozen up 24th and navigation closed; river ice broke up 28th. La Crosse, Wis., much floating ice 19th to 23d; frozen below, 28th; frozen above, 30th; Black River frozen up 25th. Burlington, Iowa, frozen over and closed 24th, earlier than for many years. Le Claire, Iowa, running ice 22d; frozen up 23d. Muscatine, Iowa, floating ice 23d. Davenport, Iowa, floating ice 23d; full of ice 24th to 26th; frozen along shore 27th to 30th. Warsaw, Ill., full of floating ice 23d. Keokuk, Iowa, running ice 23d and 30th.

*Missouri River.*—Bismarck, N. Dak., river closed 23d. Sioux City, Iowa, running ice 15th; much floating ice 17th to 20th and 22d to 30th; river channel nearly closed 24th; river gauge frozen up. Plattsmouth, Nebr., floating ice 15th.